

STANDARD INFORMATION

Standard: ANSI/CAN/UL/ULC 2271

Standard ID: Batteries for Use in Light Electric Vehicle (LEV) Applications [ANSI/CAN/UL/ULC 2271:2023 Ed.3]

Previous Standard ID: Batteries for Use in Light Electric Vehicle (LEV) Applications [ANSI/CAN/UL/ULC 2271:2018 Ed.2]

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **September 14, 2025**

IMPACT, OVERVIEW, AND ACTION REQUIRED

Impact Statement: Per our accreditation, Intertek is required to review reports against the standard revisions to confirm compliance. Once compliance is confirmed, the standard reference in the report is updated to show continued compliance to the technical requirements of the standard. Reports not updated to this version by the effective date above will be withdrawn.

This standard contains Functional Safety Requirements

Overview of Changes:

- Updates to Functional Safety criteria
- Additional requirements for protection of corrosion between dissimilar metals
- Addition of requirements for when repurposed batteries are used
- Addition of a High Rate Charge Test
- Addition of the Overload Under Discharge Test
- Addition of a Single Cell Failure Design Tolerance Test
- Revisions to Manufacturing and Production Line Testing
- Addition of a normal operation limit check in Overcharge and Overdischarge Test
- Addition of a grounding continuity test

Specific details of new/revisted requirements are found in table below

Current Listings Not Active? – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records. We will do this at no charge as long as Intertek is notified in writing prior to the review of your reports.



STANDARD INFORMATION

CLAUSE	VERDICT	COMMENT
		<i>Additions to existing requirements are <u>underlined</u> and deletions are shown lined-out below.</i>
1	Info	Scope <i>New clause added;</i>
1.5		These requirements do not cover equipment for use in hazardous locations as defined in the National Electrical Code, NFPA 70.
8	Info	Metallic Parts Resistance to Corrosion <i>New clause added;</i>
8.1		Metal EESA enclosures shall be corrosion resistant. Metal enclosures made of the following materials shall be considered to comply with the corrosion resistance requirements: a) Copper, aluminum, or stainless steel; and b) Bronze or brass, either of which containing at least 80 % copper.
8.2		<i>New clause added;</i> Ferrous enclosures for indoor application shall be protected against corrosion by enameling, painting, galvanizing, or other equivalent means. Ferrous enclosures for outdoor application shall comply with the 600-hour salt spray test in CSA C22.2 No. 94.2 / UL 50E. Additional methods to achieve corrosion protection according to CSA C22.2 No. 94.2 / UL 50E can be accepted.
13	Info	Electrical Spacings and Separation of Circuits <i>New clause added;</i>
13.5		For determination of spacing, Overvoltage category II and pollution degree 3 are applied to EESAs. Enclosures meeting IP54 or IPX7 per IEC 60529 are considered pollution degree 2. Hermetically sealed or encapsulated enclosures, or coated printing-wiring boards in compliance with the Printed Wiring Board Coating Performance Test of CSA C22.2 No. 0.2 or UL 840 are considered pollution degree 1.



CLAUSE	VERDICT	COMMENT
		<i>New clause added;</i>
13.6		CSA C22.2 No. 0.2 or UL 840 shall not be used for the clearance and creepage distance at field wiring terminals. When determining the clearance for double or reinforced insulation in accordance with CSA C22.2 No. 0.2 or UL 840, the clearances of reinforced insulation shall be dimensioned corresponding to the rated impulse voltage but choosing one step higher in the preferred series of values in the Minimum Clearances for Equipment table of CSA C22.2 No. 0.2 or UL 840 than that specified for basic insulation. If the impulse withstand voltage required for basic insulation, is other than a value taken from the preferred series, reinforced insulation shall be dimensioned to withstand 160 % of the impulse withstand voltage required for basic insulation. When determining the creepage for double or reinforced insulation in accordance with CSA C22.2 No. 0.2 or UL 840, the creepage distances for reinforced insulation shall be twice the creepage distance required for the basic insulation as determined in CSA C22.2 No. 0.2 or UL 840.
15	Info	Safety Analysis
15.1	Info	General
		<i>New clause added;</i>
15.1.1		<p>A safety analysis consisting of a hazard identification, risk analysis and risk evaluation shall be conducted on the device under test. This safety analysis shall determine which parts of the system are safety related through an existing methodology such as outlined 15.1.2. This approach shall determine the hazard scenarios and define mitigation mechanisms. This safety analysis shall identify safety circuits or software that address each hazardous condition and consider the performance of each safety circuit or software. The following conditions in (a) – (c) shall be considered unless sufficient justification (e.g. additional safety analysis) is provided by the manufacturer that these conditions are not hazardous. The following conditions in (a) – (c) shall be considered at a minimum, but are not limited to:</p> <ul style="list-style-type: none">a) Battery cell over-voltage and under-voltage;b) Battery over-temperature and under-temperature; andc) Battery over-current during charge and discharge conditions.
15.1.3		<p>The analysis of 15.1.1 is utilized to identify anticipated faults in the system which could lead to a hazardous condition <u>and is validated by compliance with 15.2. The analysis shall consider the reliability of any monitoring components and systems and any communication systems providing information to the controls that can affect safety.</u> The analysis shall consider single fault conditions in the protection circuit in addition to single faults elsewhere that could lead to a hazardous condition.</p>



CLAUSE	VERDICT	COMMENT
		<i>New section added;</i>
		Protective circuits and controls
15.2		Active protective devices shall not be relied upon for critical safety and shall comply with one of the following in (a) – (c) and comply with 15.2.2 and 15.2.3 as applicable. See standard for details.
16	Info	Cells, Electrochemical Capacitors, and Repurposed Cells and Batteries
		<i>New clause added;</i>
16.7		Sodium ion cells (e.g. Prussian Blue cells or transition metal layered oxide cells) shall comply with the sodium ion cell requirements of UL/ULC 2580 (identical to the performance and marking requirement for secondary lithium cells in UL/ULC 2580), including compliance with all the performance tests for cells.
		<i>New clause added;</i>
16.8		Batteries and battery systems using repurposed cells and batteries shall ensure that the repurposed parts have gone through an acceptable process for repurposing in accordance with UL 1974. See also 46.11.
17	Info	Manufacturing and Production Line Testing
		<i>New clause added;</i>
17.4		Assemblies/packs shall be subjected to 100 % production screening to determine that any active controls utilized to maintain cells within normal operating parameters are functioning.
21	Info	Post Test Cycle
		<i>New clause added;</i>
21.2		For those tests where rupture is identified as a non-compliant result, the DUT shall be examined at the conclusion of the test for evidence of rupture that would result in potential exposure to hazardous voltage circuits and hazards materials such as electrolyte. When determining exposure to accessible hazardous circuits or materials, the criteria outlined in 9.3 shall be applied.
23	Info	Overcharge Test
		<i>New clause added;</i>
23.3		If BMS reduces the charging current to a lower value near the end of charging phase, the sample shall be charged continually with the reduced charging current until ultimate results in 23.4 occur.



CLAUSE	VERDICT	COMMENT
23.6		<p>As a result of the overcharge test, <u>the maximum charging voltage measured on the cells shall not exceed their normal operating region</u>. Also, any of the following results in (a) – (h) below are considered a non-compliant result. See also Table 21.1 and Section 22.</p> <p>a) E – Explosion; b) F – Fire; c) C – Combustible Concentrations (if applicable to technology); d) R – Rupture (enclosure); e) L – Electrolyte Leakage (external to enclosure); f) <u>V – Venting</u>; g) S – Electric shock hazard (resistance below isolation resistance limits or dielectric breakdown); h) P – Loss of protection controls.</p>
		<p><i>New section added;</i></p> <p>High Rate Charge Test</p>
24		<p>The purpose of this test is to evaluate a battery system's ability to protect the cells in the battery system against a high rate charge condition at currents exceeding the maximum charging current of the cells.</p> <p>See standard for details.</p>
25	Info	<p>Short Circuit Test</p>
25.7		<p>As a result of the short circuit test, any of the following results in (a) – (g) below are considered a non-compliant result. <u>See also Table 21.1 and Section 22.</u></p> <p>a) <u>E – Explosion</u>; b) <u>F – Fire</u>; c) <u>C – Combustible Concentrations (if applicable to technology)</u>; d) <u>R – Rupture (enclosure)</u>; e) <u>L – Electrolyte Leakage (external to enclosure)</u>; f) <u>S – Electric shock hazard (resistance below isolation resistance limits or dielectric breakdown)</u>; g) <u>P – Loss of protection controls</u>.</p>
		<p><i>New section added;</i></p> <p>Overload Under Discharge Test</p>
26		<p>This test shall be conducted on a fully charged DUT.</p> <p>See standard for details.</p>



CLAUSE	VERDICT	COMMENT
28	Info	Temperature Test
28.4		The charge and discharge cycles are then repeated for a minimum total of 2 complete cycles of charge and discharge, <u>until consecutive charge and discharge cycles do not continue to increase the maximum cell temperature more than 2 °C (3.6 °F).</u>
		<i>New section added;</i>
		Grounding Continuity Test
32		This test applies to the electric energy storage assembly having a protective grounding system and evaluates the continuity of the protective grounding system. See standard for details.
35	Info	Crush Test
		<i>New clause added;</i>
35.5		Each sample shall only subject to one crush. The force shall be increase from zero to a maximum force value (i.e. 1,000 times the weight of the DUT or 100 kN) or when the maximum of 50 % deformation is achieved, whichever comes first and then it is removed. Monitoring for information purposes per 18.6 should be conducted during the test.
		<i>New clause added;</i>
35.6		At the conclusion of the observation period, the samples are examined for electrolyte leakage and samples with hazardous voltage circuits shall be subjected to a Dielectric Voltage Withstand Test or Isolation Resistance Test (without humidity conditioning).
		<i>New clause added;</i>
35.7		As a result of the crush test, any of the following results in (a) and (e) below are considered noncompliant results. See also Table 21.1 and Section 22. a) E – Explosion; b) F – Fire; c) C – Combustible Concentrations (if applicable to technology); d) L – Electrolyte Leakage (external to enclosure); e) S – Electric shock hazard (resistance below isolation resistance limits or dielectric breakdown);



CLAUSE	VERDICT	COMMENT
		<i>New section added;</i>
		Drop Test
36		This test is intended to evaluate whether a hazard exists when a DUT is subjected to an inadvertent drop during lifting or handling by the user when charging or replacement, etc. See standard for details.
41	Info	Immersion Test
		As a result of the water immersion test, any of the following results in (a) – (d) below are considered a non-compliant result. See also Table 21.1 and Section 22.
41.4		a) E – Explosion; b) F – Fire; c) <u>R – Rupture (enclosure);</u> d) S – Electric shock hazard (resistance below isolation resistance limits or dielectric breakdown).
42	Info	Water Exposure Test (IP Code Rating)
		As a result of the water exposure test, any of the following results in (a) – (h) below are considered a non-compliant result. See also Table 21.1 and Section 22.
42.5		a) E – Explosion; b) F – Fire; c) C – Combustible Concentrations (if applicable to technology); d) R – Rupture (enclosure); e) L – Electrolyte Leakage (external to enclosure); f) <u>V – Venting;</u> g) S – Electric shock hazard (resistance below isolation resistance limits or dielectric breakdown); h) P – Loss of protection controls.
		<i>New section added;</i>
45		Since there is a possibility that a cell may fail within a secondary lithium battery system, the battery system shall be designed to prevent a single cell failure from propagating to the extent that there is fire external to the DUT or an explosion. See standard for details.



CLAUSE	VERDICT	COMMENT
	Info	MARKINGS
46	Info	General
46.8		<p>The EESA that contains hazardous voltage circuits shall be marked <u>with the following or equivalent "WARNING: Hazardous Voltage Circuits. To Reduce the Risk of Electric Shock, Never Disassemble. No User Serviceable Parts"</u> or be marked with the electric shock hazard symbol ISO 3864 No. 5036 (lightning bolt within a triangle).</p> <p>In Canada: In English: "Warning: Hazardous Voltage Circuits"; and In French: «Attention: Circuits à tension élevée» In the United States: In English: "Warning: Hazardous Voltage Circuits".</p>
46.9		<p>EESAs shall be marked <u>with the following or equivalent "WARNING: Risk of Fire. To Reduce the Risk of Injury, user must read instruction manual"</u> or with the sign M002 of the Standard for Graphical Symbols Safety Colours and Safety Signs, Safety Signs Used in Workplaces and Public Area, ISO 7010, No. W001 (i.e. exclamation point in triangle).</p> <p>In Canada: In English: "WARNING – To Reduce the Risk of Injury, user must read instruction manual"; and In French: «AVERTISSEMENT – Pour prévenir les blessures, l'utilisateur doit lire le manuel d'utilisation» In the United States: In English: "WARNING – To reduce the risk of injury, user must read instruction manual".</p>
46.11		<p><i>New clause added;</i></p> <p>Batteries and battery systems using repurposed batteries in accordance with 16.8, shall be marked "Repurposed" or "Second Life", and "UL 1974".</p>



CLAUSE	VERDICT	COMMENT
	Info	INSTRUCTIONS
47	Info	General
		The following or equivalent marking shall be provided in the instructions: <u>"WARNING: Risk of Fire and Electric Shock. Never Disassemble. No User Serviceable Parts"</u> .
47.5		In Canada: In English: "WARNING – Risk of Fire and Electric Shock – No User Serviceable Parts"; and In French: «AVERTISSEMENT – Risque d'incendie et de choc électrique – Aucune des pièces ne peut être réparée par l'utilisateur» In the United States: In English: "WARNING – Risk of Fire and Electric Shock – No User Serviceable Parts" .
		Exception No. 1: If EESA does not contain circuits above 60 Vdc or 30 Vrms/4.24 Vpeak, the instructions shall be replaced by the following or equivalent: <u>"WARNING: Risk of Fire. Never Disassemble. No User Serviceable Parts"</u> . Exception No. 2: Accessible fuse replacement or equivalent is allowed to be user replaced.
		<i>New annex added;</i>
		Metal Compatibility
Annex B		For combinations that fall above the line in, an evaluation on the parts can be conducted to determine suitability. Protection methods such as coatings can be used but will need to be evaluated. See standard for details.